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Elaborating the motivational attributes of information need and uncertainty

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Abstract
Introduction. The study contributes to the conceptual investigation of the motivators for information seeking. The issue is examined by drawing on the ideas of the expectancy-value theory, which is a major psychological approach to motivation.
Method. A conceptual analysis was made by focusing on how the cognitive and affective motivational attributes of the constructs of information need and uncertainty have been approached in information seeking studies. The analysis of the cognitive attribute centres on the abilities and goals of the information seeker, while the study of the affective attribute examines how the actor feels about the information-seeking task.
Results. Researchers have approached the cognitive motivational attribute of information need in terms of inappropriate knowledge structure, while the affective attribute has not been specified sufficiently. The construct of uncertainty provides a more balanced picture in that it also characterises the affective attribute by discussing the motivational role of negatively coloured emotions such as anxiety.
Conclusions. From the perspective of the expectancy-value theory, the constructs of information need and uncertainty only partially explain why people engage in information seeking. Therefore, neither information need nor uncertainty can be regarded as fully-fledged motivational constructs.

Introduction

What motivates the information seeker? This question belongs to the perennial dilemmas of information science and researchers have developed a variety of constructs rendering understandable why people engage in information seeking. Within library and information science, *information need* is probably the most popular construct depicting the motivators for information seeking (Naumer and Fisher 2010). The classic conceptualisations include Taylor's (1968) model of information needs articulated in the context of reference interview and Wilson's (1981) critical analysis of the category of information need. In the 1980s and 1990s, alternative concepts were

introduced to conceptualise the motivators for infomation seeking and retrieval. Belkin and his colleagues (1982) developed the hypothesis of the *anomalous state of knowledge* (ASK), while Dervin (1983) elaborated the category of *gap*. The alternative constructs also include the principle of *uncertainty* formulated by Kuhlthau (1993).

Unfortunately, since the early 1990s, the conceptual analysis of the motivators for information seeking has remained an under-researched topic. However, it is a significant issue because the study of such motivators deepens our understanding about the nature of information-seeking process at its initial phase in particular. Second, the importance of the topic can be justified by the fact that concepts such as information need and uncertainty belong to the core vocabulary of library and information science (Anderson 2010; Case 2007: 72-82). Conceptual studies can reveal the strengths and weaknesses of the above terms and provide new views on their usefulness.

The present study contributes to information-seeking studies by focusing on the constructs of *information need* and *uncertainty*. The main research goal is to examine how they have been conceptualised as motivational constructs explaining why people intentionally start seeking for information and why they continue this activity. Following Wilson's (2000: 49) definition, information seeking is understood as a form of human information behaviour dealing with '*the purposive seeking for information as a consequence of a need to satisfy some goal. In the course of seeking, the individual may interact with manual information systems (such as a newspaper or a library), or with computer-based systems (such as the World Wide Web)*'. While focusing on the motivators for purposive seeking of information, the present study acknowledges the relevance of information need and uncertainty as factors that also can trigger '*micro-level information behaviour*' such as information searching and information retrieval. Since this paper concentrates on the cognitive and affective attributes of information need and uncertainty, not on the specific forms of human information behaviour triggered by these factors, no attempt will be made discuss how information need would motivate information searching or retrieval compared to information seeking.

The study of the motivators of information seeking is complicated by the fact that information need and uncertainty are constituted by cognitive, affective, situational and social factors. For example, the time available for the performance of a task at hand is a situational factor, which affects the ways in which the urgency of information need is experienced (Byström and Järvelin 1995: 196). Similarly, the formation of information needs may be influenced by a number of social factors such as norms and roles prevailing in a community or organization (Sundin and Johannison 2005: 110-111). A more concrete example of the social factors can be found in the context of imposed search tasks; the information needs of a student writing an essay are at least partly shaped by the student's expectation about what the instructor wants (Gross 2010: 5730).

To strengthen the focus of the study, the attention will be directed to the *cognitive* and *affective* motivational attributes of information need and uncertainty. Since psychology provides the most elaborate approaches to the study of human motivation, the present study makes use of this potential in order to gain a novel perspective on the analysis of the concepts of information need and uncertainty. More specifically, the study makes use of the ideas of the *expectancy-value theory*, a major psychological approach to motivation (Petri and Govern 2004). As a cognitive motivation theory, this approach is particularly suitable for the analysis of the cognitive and affective factors that trigger and drive information seeking. However, the expectancy-value theory will not be tested empirically. The present study focuses on the conceptual analysis of information need and uncertainty. More precisely, an attempt will be made to elaborate the cognitive and affective

attributes of information need and uncertainty by using the conceptualisations provided by the expectancy-value theory.

The paper is structured as follows. To give background, the concepts of motivation, information need and uncertainty are characterised. Then, the research design is specified, followed by the presentation of the research findings. The last sections discuss the main findings and draw conclusions about their significance.

Approaches to motivation

The factors triggering and driving human behaviour have been conceptualised in a variety of models and theories developed in psychology. The diversity of the psychological approaches to motivation defies all attempts to draw a conclusive picture of this topic; Petri (2010) provides a useful overview of motivation research. *Motivation* is perhaps the largest umbrella concept for diverse factors triggering and driving action or behaviour (Ambrose and Kulik 1999; Murphy *et al.* 2000). In general, motivation denotes forces acting either on or within a person to initiate and direct behaviour (Petri and Govern 2004: 16). Such forces may stand for motives, needs, goals and related factors of which motivation is constituted as a whole. According to Gollwitzer and his associates (2000: 198), motivation refers to what type of goals people choose and how they go about implementing them. Motivation also deals with when and how goal-directed behaviour gets started, is energised, sustained and stopped.

So far, no consensus has been reached among researchers about how to define the relationships between the concepts of motivation, motive and need. Often, the conceptualisations of need assume that needs are internal motives. This view is in contrast to the assumption that the ultimate sources of motivation are external, for example, goal objects or social factors such as the presence of other people. Need theorists conceptualise different motive states as needs that, when active, promote behaviour to reduce those needs (Petri and Govern 2004: 20). According to Telama (1986: 152), the concept of need refers to a general level goal, while motive stands for a more detailed interest in an object or activity; therefore, motive can be conceived of as a need focused on a certain object. Thus, in the end, a motive would trigger an activity. The existence of a need does not necessarily lead into action, because a specific motive is required to trigger it.

According to Eccles and Wigfield (2002: 110), modern theories of motivation primarily focus on the relation of beliefs, values and goals with action. These theories also discuss the extent to which motives result from internal needs and/or external goals, rewards and incentives. Behavioural psychologists have stressed the importance of external goals in prompting action, while cognitive psychologists assume that human behaviour is directed as a result of the active processing and interpretation of information (Petri and Govern 2004: 248). Because of this focus, the theories of cognitive motivation are particularly relevant for the present study. The most significant cognitive motivation theories include attribution approaches, cognitive dissonance theory and expectancy-value theories (Petri 2010). In addition, there are specific, cognitively-oriented approaches to the study of motivation such as the self-determination theory (Deci and Ryan 1985). Of these approaches, expectancy-value theories are most intriguing from the perspective of the present study because they provide relevant categories for the analysis of the cognitive and affective motivational attributes of information need and uncertainty.

The viewpoint of expectancy-value theories

Expectancy-value theories have been developed in psychology since the 1930s. In fact, there is no one expectancy-theory but an extensive family of individual formulations (Steel and König 2006: 893). Early contributions include Vroom's (1964) theory suggesting that motivation is a function of three components: expectancy, instrumentality and valence. Vroom (1964) defined *expectancy* as a momentary belief followed by a particular outcome, while *instrumentality* is the person's perception of the probability that performance will lead to a specific outcome. Finally, *valence* refers to the '*affective orientations toward particular outcomes*' (Vroom 1964: 15). Vroom hypothetised that all three of these factors influence motivation in a multiplicative fashion. Thus, if even one of these factors has value zero, for example, positive expectancy is completely lacking, the person will have no motivation for the performance of a task, even though his or her beliefs about instrumentality and valence would be high.

Recent expectancy-value theories have refined Vroom's formulations. This is due to a critique addressed towards the early theories that approached decision-making as an overly rational procedure based on the mechanistic calculation of the values of motivational components (Steel and König 2006: 890; 893). To avoid the rationalistic bias, modern expectancy-value theories have further elaborated the expectancy and value components (Wigfield *et al.* 2008: 408-409). Modern expectancy-value theories argue that individuals' choice, persistence and performance can be explained by their beliefs about how well they will do on the activity and the extent to which they value the activity (Petri and Govern 2004: 247-279; Wigfield and Eccles 2000: 68). Such evaluations do not only incorporate cognitive (rational) but also affective motivational components or attributes.

The study conducted by Pintrich and De Groot (1990) exemplifies well the use of the ideas of modern expectancy-value theories.They examined the motivational and self-regulated learning attributes of classroom academic performance and identified three attributes that may be linked to such behaviour. First, the *expectancy attribute* includes students' beliefs about their ability to perform a learning task. This motivational attribute involves the actor's answers to the question, *Can I do this task?* The attribute is cognitive in nature since it is linked to the actors' metacognition, their use of cognitive strategies and their effort management. Secondly, the *value attribute* is also cognitive in nature since it involves the actors' goals for the task and their beliefs about the importance and interest of the task. This motivational attribute essentially concerns the actors' reasons for learning activity: *Why am I doing this task?* Thirdly, the *affective attribute* includes the actors' emotional reactions to the learning task. The important issue for actors involves the question, *How do I feel about this task?* This attribute may be measured by focusing on a variety of affective reactions such as pride and anxiety.

The empirical investigation of the expectancy attribute indicated that students who believed they were capable were more likely to report use of cognitive strategies, to be more self-regulating in terms of reporting more use of metacognitive strategies, and to persist more often at difficult or uninteresting academic tasks (Pintrich and De Groot 1990:37). The analysis of the value attribute showed that students who were motivated to learn the material (not just get good grades) and believed that their school work was interesting and important were more cognitively engaged in trying to learn and comprehend the materal. Finally, the study of the affective attribute revealed that negative feelings manifesting themselves in test anxiety engenders worry about one's capabilities; highly-anxious students reported less self-regulation and persistence. Overall, the study showed that these three attributes provide ecologically valid data on academic performance on actual classroom tasks in support of a general model of self-regulated learning (Pintrich and De Groot 1990: 38).

Approaches to information need and uncertainty

Information need

Traditionally, information scientists have preferred the term need, not motive or motivation while approaching the triggers and drivers of information seeking. More specifically, the term information need has been employed to label the factors giving rise to information seeking. A major indication of the incipient research interest in these issues is the series of articles on information needs and uses published in Annual Review of Information Science and Technology (ARIST) since 1966 (see, for example, Menzel 1966). In the early years, the most influential model of information needs was developed by Taylor (1968). He identified four levels at which information needs are articulated in the context of reference interview in libraries. Taylors' model will be discussed in greater detail later on.

The nature of information need was further specified by Derr (1983). Based on conceptual analysis he concluded that necessary and sufficient conditions for the need for certain information exist if it is judged that a genuine or legitimate information purpose exists and it is judged that the information, in question, contributes to the achievement of the information purpose. Krikelas (1983: 8-9) outlined a cognitive oriented approach to information need by distinguishing between immediate and deferred information needs. The former were defined as the active or dynamic state of information seeking which results from the realisation of a gap between information that is applied to a problem and the solution of the problem. The deferred need is the passive or static need that lies dormant until activated by the realisation of a gap.

In the early 1980s, the most influential study of information need was conducted by Wilson (1981). He criticised the ambiguity of the concept of information need and proposed that information scientists would gradually abandon it. The focus should be placed on information-seeking behaviour that may satisfy people's cognitive and affective needs. In particular, Wilson (1981) critiqued the construct of information need impregnated with connotation of a *basic need*, similar in its quality to fundamental needs such as the need for shelter. Wilson approached information need as a secondary order need which arose out of the desire to satisfy the primary needs. Thus, most information needs could be accounted for by more general needs: physiological needs, emotional needs and cognitive needs. Importantly, in order to satisfy these needs an individual may commit himself to seeking information.

Since the mid 1980s, a growing criticism was directed to the assumption that information needs would be described as relatively stable and entity-like factors that explain why people engage in information seeking (Dervin and Nilan 1986). Harter (1992) argued that to talk about an individual's information need is virtually the same as describing his or her current psychological state, because needs shift stochastically as each relevant piece of information is encountered. This suggests that information needs are not something fixed and long-lasting.

The interest in the conceptual issues of information need decreased in the 2000s. This may be due to the fact that the research focus shifted from the motivators of information seeking to the processes and strategies of information seeking. However, the interest in the motivators of information seeking has not disappeared totally. For example, Sundin and Johannison (2005) characterised information need from the perspective of neo-pragmatism, while Case (2007: 72-82) and Naumer and Fisher (2010) provide useful reviews about diverse approaches to information need. Most recently, based on the careful analysis of Taylor's (1968) classic model, Cole (2011) has proposed a theory of information need for information retrieval. The theory proposes, for example, that

information need is made up of levels, not phases and that the user's information need manifests itself to the user differently over the course of performing a task. Since this theory mainly focuses on the specific issues of information retrieval, it will not be reviewed in more detail.

Uncertainty

Since the 1940s, information and communication scientists have also acknowledged uncertainty as a persistent characteristic and motivator of information seeking (Anderson 2010). In the context of information seeking, uncertainty may manifest itself as cognitive or affective uncertainty. The former can appear as unclear thoughts or gaps in meaning (Kuhlthau 1993). The affective uncertainty is a feeling of unease due to the presence of cognitive uncertainty and it can be experienced as irritation, frustration, and anxiety (Nahl 2007: 26). Wilson (1999: 265) characterises uncertainty as '*the ghost at the feast*'; uncertainty is a natural experience within the process of information seeking. Chowdhury and his associates (2011: 161) draw attention to the fact that information users may feel uncertain at any stage of the information seeking process. However, uncertainty is not always negative or undesirable. Positive uncertainty may prompt users to discovering new information sources; thus, it may also provide useful insights for information seeking taking place in the future (Chowdhury *et al.* 2011: 173; Anderson 2006).

The construct of uncertainty as a motivator of information seeking is most often associated with the Information Search Process model developed by Kuhlthau (1993; 2004). Her studies have focused on the experience of users within the stages of the information search process as they move from ambiguity to specificity, or what is called uncertainty to understanding. Uncertainty may be identified most easily at the initiation stage of the *information search process* when a person first becomes aware of a lack of knowledge or understanding. At that time, feelings of uncertainty and apprehension are common. At this point, the task is merely to recognise a need for information (Kuhlthau 1993: 343). Thoughts are vague and ambiguous centering on the general problem area of uncertainty. In addition, at the stage of *exploration*, an inability to express precisely what information is needed makes communication between the user and the system awkward. The cognitive and affective attributes of Kuhlthau's model will be discussed in greater detail below.

Conceptual framework

Pintrich and De Groot's (1990) approach, discussed above, focuses on the cognitive and affective factors triggering and driving the performance of learning tasks. However, the scope of this approach may be extended to include the motivators for cognitive behaviour more generally, including information-seeking behaviour. Marchionini (1995: 8-9) provides further support for this idea. According to him, learning and information seeking can be conceived as closely related processes since they share the same goal: to change one's state of knowledge. Thus, information seeking can be approached as a type of learning, even though the processes are not identical. Learning demands retention while in the case of information seeking, the information may be used for a temporary task (Marchionini 1995: 8). Due to close relationship between learning and information seeking processes, Pintrich and De Groot's (1990) approach is thus also considered relevant for the conceptualisation of the motivators for information seeking.

Following the ideas of Pintrich and De Groot (1990: 33-34) we make the assumption that the cognitive and affective motivational attributes are ultimately constituted by the actor's internal dialogue of questions and answers concerning the information-seeking task. First, the cognitive

motivational attribute deals with the actor's question about his or her ability to perform such tasks, more specifically expressed as, *Can I do this information-seeking task?* The answer is dependent on diverse factors such as the perceived difficulty of this task and the actor's current level of knowledge about the subject area. Secondly, the cognitive motivational attribute also deals with the question about the importance of the task, expressed as, *Why am I doing this information-seeking task?* The answer is dependent on factors such as the actor's goals for this particular task. For example, the more significant the information-seeking task, the more willing is the actor to start seeking for further information. Third, the affective motivational attribute deals with the question, *How do I feel about this information-seeking task?* The nature of the answer depends on a variety of factors such as the sense of intrinsic pleasantness or unpleasantness related to the task (Ellsworth and Scherer 2003: 574; Nahl 2007: 10; 19). We may assume, for example, that the stronger the sense of pleasantness, the more ready is the actor to start seeking for information. The conceptual framework is illustrated in Figure 1.

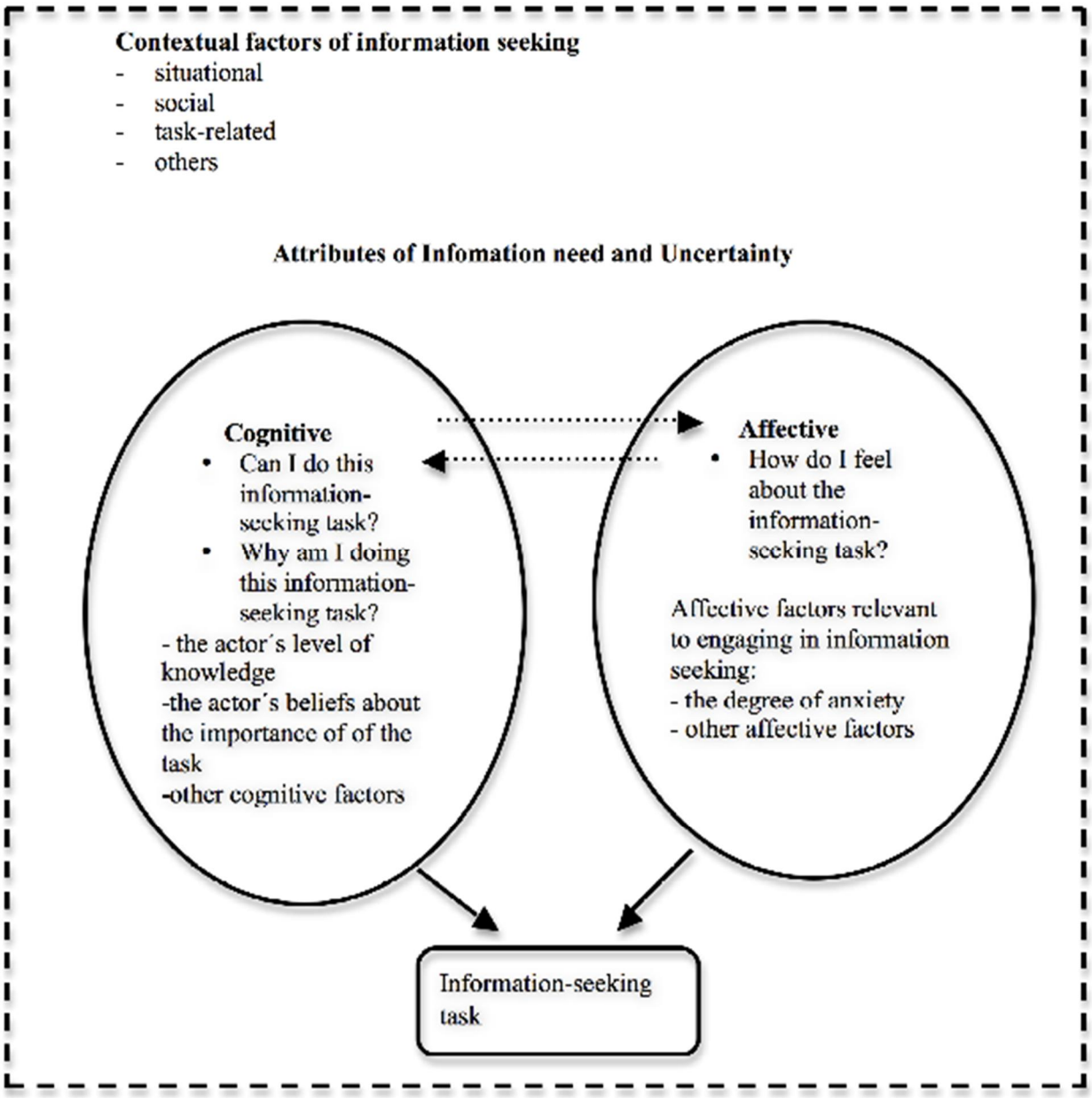

Figure 1. Conceptual framework of the study

Figure 1 suggests that information need and uncertainty are constituted by cognitive and affective motivational attributes. Even though they can be presented as individual categories, they are interrelated in practice, as depicted by the horizontal arrows. Further, information need or uncertainty thus constituted never appear in a vacuum; they are motivators for information seeking that serves the ends of performing specific work tasks, for example. Therefore, the contextual factors affect the ways in which the cognitive and affective motivational attributes manifest themselves. Such factors may be situational, for example, the urgency of a work task, or social, e.g., the social norms prevailing in a work community. Contextual factors may also be task-related: for example, the work role of the actor.

Research questions

To examine the motivational attributes in greater detail, the present study addresses the following research questions:

- RQ1: How is the cognitive attribute dealing with the actor's ability to perform the information-seeking task approached in the conceptualisations of information need and uncertainty?
- RQ2: How is the cognitive attribute dealing with the actors' beliefs about the importance of the information-seeking task approached in such conceptualisations?
- RQ3: How is the affective attribute dealing with the actor's emotions about the information-seeking task approached in the conceptualisations of information need and uncertainty?
- RQ4: How are the relationships between the cognitive and affective attributes of information need and uncertainty conceptualised in information seeking studies so far?

To strengthen the focus of the study, a number of limitations appeared to be necessary. First, related concepts such as anomalous state of knowledge (ASK) (Belkin *et al.* 1982) will not be reviewed. ASK is excluded from the study because information scientists have primarily conceptualised it as a factor triggering information retrieval, not information seeking (Cole 2011). For the same reason, studies specifically characterising the motivators for interactive information retrieval or searching will be excluded (Cole 2011; Xie 2007). Secondly, studies examining the nature of information need in other contexts such as personal information management (Bruce 2005) will not be reviewed. Thirdly, related constructs such as gap (Dervin 1983) will not be examined. It is evident that the analysis of motivational attributes of the above constructs would have required a separate study.

Research material and methodology

The present study draws primarily on the information seeking research literature. In the identification of relevant literature, the *EBSCO* and *Library and Information Science Abstracts* (LISA) databases were searched by using three keywords: *information need, information seeking* and *uncertainty*. EBSCO and LISA were used because they are the two most frequently used databases with the largest coverage of information science papers, books and other types of documents. In addition, major review articles of information needs and uncertainty were scrutinised (Anderson 2010; Case 2007: 68-83; Naumer and Fisher 2010; Wilson 1997). In this way, altogether ninety-seven relevant articles and books discussing the constructs of information need and uncertainty were identified.

The initial analysis of the above articles and books indicated that the research material is saturated enough; it became evident that additional studies would not essentially change the picture of the cognitive and affective attributes of information need and uncertainty. Further support for this assumption was found from recent review articles on information need (Naumer and Fisher 2010) and uncertainty (Anderson 2010). Due to space limitations, only the key studies of information need and uncertainty can be discussed in more detail in the rest of this article. The main attention was devoted to contributions that explicitly discuss the cognitive and affective elements of information need and uncertainty, for example, Allen (1997), Kuhlthau (1993), Taylor (1968) and Wilson (1981). All articles and books scrutinised for the study are not cited because many of them repeat the ideas presented by the above scholars.

The research material was examined by means of evolutionary concept analysis (Rodgers 2000). This method can be defined as a type of content analysis. In general, content analysis is a set of quantitative and qualitative ways to study texts of diverse kinds, for example, transcribed interviews and newspaper articles (Krippendorff 2004). Evolutionary concept analysis is a form of qualitative content analysis focusing on how the concepts and their attributes are used in different contexts and how the content assigned to the attributes changes over time (Rodgers 2000). Evolutionary concept analysis includes six major steps (Timmins 2006: 376-377):

- *Step 1. Identify the concepts of interest and associated expressions.* In the present study, the concepts of interest are information need and uncertainty as motivators for information seeking.
- *Step 2. Identify and select an appropriate setting and sample for data collection.* The methods of data collection (step 2) were described above.
- *Step 3. Collect data relevant to identify the attributes of the concepts and the contextual basis of the concepts.* The present study discusses the cognitive and affective attributes of information need and uncertainty.
- *Step 4. Analyse data regarding the above attributes of the concepts.* The data were analysed by scrutinising how various researchers have defined the above attributes and their relationships.
- *Step 5. Identify an exemplar of the concepts.* In the analysis, the main studies on information needs and uncertainty, for instance, Kuhlthau (1993), Taylor (1968), and Wilson (1981) were approached as exemplars of the concepts of information need and uncertainty.
- *Step 6. Identify implications for further development of the concepts.* The implications for further development of the concepts are reviewed in the concluding sections of the article.

The motivational attributes of information need and uncertainty

The cognitive attribute

The term cognition is generally used to describe the intellectual or perceptual processes occurring within the mind when an individual analyses and interprets both the world around herself and her own thoughts and actions (Petri and Govern 2004: 248). Cognitive attributes of motivation typically include factors constitutive of planning, inferring, comparing and evaluating. Therefore, for

example, an individual's cognitive abilities, beliefs, goals and values are important constituents of the cognitive attribute (Pintrich and De Groot 1990: 33-34). Naumer and Fisher (2010: 2455) point out that under the constructivist or cognitive view, people's information needs are often conceptualised in terms of lack of knowledge about a topic. Taylor's (1968) classic model exemplifies well this approach.

Taylor (1968: 182) postulated four levels at which information need may be expressed in reference interview in particular. At the level of the *visceral need*, information need manifests itself only as a vague sort of dissatisfation and it is probably inexpressible in linguistic terms. At the level of *conscious need* there is a mental description of an ill-defined area of indecision. Information need can be described at this level although the articulation may consist of an ambiguous and rambling statement only. The inquirer may, at this level, talk with someone to sharpen her focus. At the level of *formalised need*, an inquirer can form a qualified and rational statement of her question. The inquirer is now able to describe her area of doubt in concrete terms. Finally, at the level of *compromised need*, the question is recast in anticipation of what the files of an information system can deliver.

From the perspective of Pintrich and De Groot's (1990) study it soon becomes evident that Taylor's (1968) model provides only implicit answers to questions concerning the inquirer's abilities to perform the information-seeking task as well as the perceived importance of this task. Taylor does not explicitly reflect the motivational questions *Can I do this information-seeking task?* and, *Why am I doing this task?* Instead, Taylor's model suggests that the inquirer's articulation of the information need may become more sophisticated in dialogue with a reference librarian, for example. Therefore, a positive answer to the question, *Can I do this information-seeking task?* is dependent on the extent to which the inquirer is able to specify her question. Any progress made in this regard may encourage, i.e., motivate, the inquirer to continue the information-seeking process. However, Taylor's model does not answer the question concerning the importance of the endeavour, that is, *Why am I doing this information-seeking task?* Therefore, looking at the cognitive attribute, Taylor's model cannot be characterised as a full-fledged approach to motivation explaining why people engage in information seeking.

The cognitive motivational attribute is also conceptualised in Allen's (1997: 113-114) situational model of information need. More specifically, the model is concerned with how an individual's knowledge structures influence problem solving in diverse situations. Most importantly, information needs may occur whenever there is a failure of the individual knowledge needed for perception, alternative identification, or alternative selection. Allen's (1997) model allows the elaboration of the cognitive attribute of information need by considering how knowledge structures are employed in perception, how knowledge structures suggest alternative courses of action and how knowledge structures are used to select a course of action in the context of problem-solving. The questions concerning the cognitive abilities of the actor (*Can I do this information-seeking task?*) and the importance of the information-seeking task (*Why am I doing it?*) are approached from the perspective of situation-specific problem solving. Allen (1997) is more explicit than Taylor (1968) with regard to the former question; the positive answer is dependent on the degree to which the actor's knowledge structure is appropriate.

Since Allen (1997), similarly to Taylor (1968), does not reflect on whether the identification of an inadequate knowledge structure would also trigger information seeking, the question about the motivational force of the cognitive attribute remains open. In contrast, the question, *Why am I doing this information-seeking task?* is answered more clearly. Information seeking is seen as important because it makes it possible to solve the problem at hand. Ultimately, this suggests that information

need is no longer the primary factor explaining why people engage in information seeking. The triggering role is given to a contextual factor, that is, problem solving. Since information need is conceptualised as a derivative category of problem solving, information need plays a secondary role as a motivator for information seeking.

The cognitive attribute of uncertainty is conceptualised most specifically in Kuhlthau's (1993) *information search process* model. In this regard, the *principle of uncertainty* is particularly significant.

Uncertainty is a cognitive state that commonly causes affective symptoms of anxiety and lack of confidence. Uncertainty and anxiety can be expected in the early stages of the information search process. The affective symptoms of uncertainty, confusion and frustration are associated with vague, unclear thought about a topic or question. As knowledge states shift to more clearly focused thoughts, a parallel shift occurs in feelings of increased confidence. Uncertainty due to a lack of understanding, a gap in meaning, or a limited construct initiates the information-seeking process. (Kuhlthau 1993: 437)

The cognitive motivational attribute is made understandable by emphasising the role of *vague thoughts* (Kuhlthau 1993: 343). Further, it is assumed that uncertainty due to a lack of understanding, a gap in meaning, or a limited construct initiates the process of information seeking. Similar to Taylor's (1968) approach, however, the characterisation of the cognitive attribute of uncertainty remains at a general level. The *information search process model* suggests that the ability to perform an information-seeking task is dependent on the extent to which the information seeker's construct of the topic is limited. However, it is evident that merely identifying a gap in meaning does not necessarily lead the actor to accessing information sources. Similar to Taylor (1968), Kuhlthau (1993) does not explicitly reflect the question, *Why am I doing this information-seeking task?* However, the *information search process* model suggests an implicit answer: to reduce uncertainty by clarifying one's thoughts. Similar to Allen's (1997) model, the answer only becomes meaningful in a broader context. In the case of the Information Search Processing model, the typical context is the performance of a learning task.

Summing up: information scientists have conceptualised the cognitive motivational attribute of information need and uncertainty at a general level only. Typically, this attribute is approached in terms of deficient knowledge structure or vague thoughts. The models discussed above provide only implicit answers to questions concerning the actor's ability to perform the information-seeking task and the perceived importance of such tasks. However, as exemplified by Allen's (1997) and Kuhlthau's (1993) models, the cognitive attribute gains more explanatory power if it is linked to contextual factors such as the requirements of problem solving or performing a learning task.

The affective attribute

The definition of affective attribute of motivation is rendered difficult in that there is no consensus among researchers about the ultimate nature of emotions and affects. *Appraisal theories* exemplify perhaps the most influential psychological perspective on emotions (Ellsworth and Scherer 2003). These theories suggest that actors constantly evaluate the relevance of environmental changes for their own well-being, checking whether significant stimuli are present or absent, beneficial or harmful and easy or difficult to approach or avoid. These appraisals result in action tendencies, which are experienced as emotions. However, thinking and feeling are inextricably interrelated

most of the time: most ways of interpreting one's environment are inherently emotional and emotions influence thinking. Thus, reason (cognition) and passion (emotion) are not independent domains.

In the context of the present study, the affective motivational attribute may be conceived as an emotional reaction to the information-seeking task. The main question concerning the affective attribute is, *How do I feel about this information-seeking task?* A variety of affective reactions may appear in this context, ranging from happiness to anxiety.

The affective attribute is seldom characterised in the conceptualisations of information need. For example, Taylor (1968) and Allen (1997) focus solely on the cognitive attribute. Wilson (1981: 9) characterises affective need as specific type of human needs; however, affective need is not approached as an attribute of information need because he questioned it as a scientific term. Yet, despite this terminological preference, Wilson's approach to affective need is relevant for the present study, because the characterisation of such need immediately deals with the question, *How do I feel about this information-seeking task?*

According to Wilson (1981: 9), the choice of information sources may be guided by affective needs as much, if not more than, by cognitive needs. For example, in seeking information from a senior colleague, a novice worker may be more interested in being recognised and accepted as a particular kind of person than in the actual subject content of the message; in other words, he may be seeking approval or recognition. The affective attribute renders it meaningful why certain information sources are seen more attractive than others. Although the affective attribute can considerably influence the formation of source preferences, the existence of this preference alone may not be sufficient to trigger the information seeking process. It may be started more probably if the affective attribute is supported by favourable contextual factors such as the instant availability of a senior colleague as a potential source of information.

The affective attribute of uncertainty is characterised in greater detail in Kuhlthau's (1993) *information search process* model. Interestingly, in the graphical illustration of the model, uncertainty is placed in the field of *feelings* denoting the affective attribute (Kuhlthau 1993: 343). Logically, this conflicts with the *principle of uncertainty* proposing that uncertainty is primarily a cognitive state that can cause affective symptoms of anxiety and lack of confidence. Nevertheless, Kuhlthau (1993) approaches uncertainty as an affective factor that is particularly characteristic of the first phase of the *information search process*; that is, *initiation*. At this stage, the affective attribute is coloured negatively, for example, as apprehension at work ahead (Kuhlthau 2004: 44). Negative emotions are also characteristic of the next stages of Kuhlthau's model. At the phases of *topic selection* and *exploration*, the information seeker may experience confusion, doubt, threat and anxiety (Kuhlthau 2004: 46-47).

However, the actor may also experience positive emotions. Already at the stage of *topic selection*, feelings like brief elation and anticipation of prospective task may be experienced. The positive emotions become more common at the later phases of Information Search Processing. At the stages of *Focus formulation* and *Collection*, the information seeker may experience optimism, confidence and increased interest, for example (Kuhlthau 2004: 46-49). At the final stage, i.e., *Presentation* or *Search closure*, the affective attribute can be coloured either positively (satisfaction) or negatively (disappointment) (Kuhlthau 2004: 50).

As a whole, the *information search process model* provides a nuanced picture of the affective motivational attribute of uncertainty. The model suggests that both positively and negatively

coloured emotions may influence the decision to start or continue information seeking. Again, however, the question remains about whether the experience of an emotion, e.g., anxiety would be a sufficient trigger of information seeking. Similar to Wilson (1981) we may think that the individual's willingness to start seeking for information is increased if positive affective factors such as optimism are supported by favourable contextual factors, for example, an instant availability of a knowledgeable colleague.

To sum up: information scientists have rarely conceptualised the affective attribute of information need and the characterisations have remained at a general level. The conceptualisations of the affective attribute of uncertainty are more sophisticated. In particular, Kuhlthau's model excels in this regard. Interestingly, her model also draws attention to the fact that the affective attribute of uncertainty may also be positively coloured.

The relationships between the cognitive and affective attributes in context

The above analysis demonstrated that looking separately at the cognitive or affective attributes of information need and uncertainty does not provide a sufficient explanation of why people start seeking for information. Therefore, the picture has to be elaborated by analysing the relationships between cognitive and affective attributes. In addition, attention has to be paid to how diverse contextual factors are taken into account in such conceptualisations.

Wilson (1981: 7-9) was among the first information scientists to draw attention to the fact that affective needs may give rise to cognitive needs and vice versa. However, he did not examine the relationships of such needs in greater detail. Instead, Wilson (1981: 9) characterised both cognitive and affective needs from the viewpoint of contextual factors. They bring about conditions in which cognitive and affective needs may interact. Most importantly, the performance of particular tasks and the processes of planning and decision-making are posited as the principal generators of cognitive needs. On the other hand, the nature of the organization, coupled with the individual's personality structure, can create affective needs such as the need for achievement, for self-expression and self-actualisation. According to Wilson (1981: 9), the particular pattern of needs and the resulting form of information-seeking behaviour will be a function of all such factors, plus factors such as the organizational level at which a role is performed.

The relationships between the cognitive and affective attributes are conceptualised most explicitly in the context of the *principle of uncertainty* (Kuhlthau 1993: 437). It suggests that the affective symptoms of uncertainty, confusion and frustration are associated with vague and unclear thoughts about a topic or question. As knowledge states shift to more clearly focused thoughts along with the information search process, a parallel shift occurs in feelings of increased confidence. For example, at the stage of *topic selection*, cognitive factors such as predicting outcome of possible choices may be linked to feelings like anticipation of prospective task (Kuhlthau 2004: 46). Further, at the stage of *exploration*, cognitive factors can manifest themselves in identifying several possible foci; this may be associated to feelings such as doubt and confusion (Kuhlthau 2004: 47).

Kuhlthau's (2004: 165-186) empirical findings show that the relationships between the cognitive and affective attributes of uncertainty should not only be examined as separate categories (see also Kuhlthau 1991; 1999). Rather, they should be conceptualised together in specific contexts such as work-task performance. Her empirical studies also demonstrate that the main contextual factors affecting the experience of uncertainty and choices within the information search process include the nature of the learning task or research assignment at hand, time allotted to the information seeking and the information available (Kuhlthau 1991: 362; Kuhlthau 2004: 195-199). Ultimately,

how the cognitive and affective factors are related depend on the nature of contextual factors of these kinds. For example, at the phase of *topic selection*, the weighing of topics against project requirements (cognitive attribute) may be associated with a higher level of anxiety (affective attribute) if the time frame of the project (contextual factor) is very narrow.

Summing up: within the tradition of information seeking studies, the *information search process* model and the *principle of uncertainty* provide the most sophisticated picture of the relationships between the cognitive and affective motivational attributes. Yet, a decontextualised approach to these relationships does not add much to the understanding of why people engage in information seeking. However, the picture of the motivators for information seeking can be substantiated by putting these relationships in context, as evidenced by Kuhlthau's (1991; 1999) empirical findings.

Discussion

Drawing on the ideas of Pintrich and De Groot (1990), an attempt was made to elaborate on the picture of information need and uncertainty as motivators for information seeking. Pintrich and De Groot's (1990) study provided relevant categories for a detailed examination of information need and uncertainty as motivational constructs.

The findings indicate that from the perspective of the cognitive psychological approach developed by Pintrich and De Groot (1990), the constructs of information need and uncertainty only partially explain why people engage in information seeking. From this particular viewpoint, neither information need nor uncertainty can be regarded as full-fledged motivational constructs. In the conceptualisations of information need, the main attention has been paid to the cognitive motivational attributes while the affective attribute has been largely ignored. The conceptualisations of uncertainty exhibit a more balanced view in that an equal attention has been devoted to the affective attribute. Kuhthau's (1993) model is perhaps the best example of this approach. As a whole, information need and uncertainty are insufficient as motivational constructs mainly because they remain implicit about the goal of the information-seeking task. Table 1 summarises the main findings of the study.

Table 1: Comparison of the cognitive and affective attributes of information need and uncertainty

	Information need	**Uncertainty**
Cognitive component 1: ability to perform the information-seeking task	The ability to seek for information is dependent on the degree to which the actor's knowledge structure is appropriate (Allen 1997)	The ability to seek for information is dependent on the extent to which the actor's construct of the topic is limited (Kuhlthau 1993)
Cognitive component 2: Beliefs about the importance of the information-seeking task	Seeking information is important because it makes it possible to solve the problem at hand (Allen 1997)	Seeking information is important because it can reduce uncertainty by clarifying one's thoughts (Kuhlthau 1993)
Affective component: actor's emotions about the information-seeking task	Actor's emotions render it meaningful why certain information sources are seen more attractive than others (Wilson 1981)	Both positively and negatively coloured emotions may influence the decision to start or continue information seeking (Kuhlthau 1993)
The relationships between the cognitive and affective components	The nature of interaction between cognitive and affective needs depends on contextual factors such as performance of particular tasks and the individual's personality structure (Wilson 1981)	The interaction between cognitive and affective components depends on contextual factors such as the stage of the information search process. For example, at the early stages of the process, negative affective symptoms of uncertainty such as anxiety are associated with vague thoughts (Kuhlthau 1993)

Table 1 suggests that in the conceptualisations of information need, the factors dealing with the author's ability to perform the information-seeking task (referred to as cognitive attribute 1) are primarily approached in terms of deficient knowledge structures employed in problem-solving (Allen 1997). In the conceptualisation of uncertainty, this attribute is characterised by referring to vague thoughts or gap in meaning (Kuhlthau 1993). All in all, the conceptualisations of information need and uncertainty are quite similar with regard to cognitive attribute 1. The characterisations of cognitive attribute 2 dealing with the actor's belief about the importance of information-seeking task differ more clearly. The conceptualisations of information need place the main emphasis on the significance of solving problems at hand by means of seeking information (Allen 1997), while the characterisation of uncertainty (Kuhlthau 1993) draws attention to the aim of reducing uncertainty by clarifying one's thoughts.

Similar to the cognitive attributes 1 and 2, the characterisations of the affective attribute of information need have remained at a general level. Wilson (1981) described the affective needs as factors that render it meaningful why certain information sources are preferred over others. On the other hand, the affective attribute is characterised in a more detail in the principle of uncertainty proposed by Kuhlthau (1993: 347). She draws attention to the fact that the affective attribute may be coloured both positively (for example, optimism) and negatively (for example, anxiety). The *principle of uncertainty* also suggests that the strength of such emotions can influence on the decision to start or continue information seeking.

The analysis demonstrated that information need and uncertainty as motivators for information seeking can be rendered more understandable by examining the relationships of cognitive and affective attributes in diverse contexts such as research assignment at hand (Kuhlthau 1993) or performing particular work tasks (Wilson 1981). Except for the *information search process* model, the conceptualisations of the interrelationships of the above attributes have remained at a general level. Even though this model provides a sophisticated approach to the examination of how *thoughts* (cognitive) and *feelings* (affective) are intertwined at the diverse stages of the model , this approach alone is insufficient to answer the three main questions dealing with the actor's cognitive abilities, the importance of the information-seeking task and emotions attached to it. In particular, the question, *Why seek information?* can only be answered meaningfully by examining the cognitive and affective factors together with diverse contextual factors such as the requirements of a work task at hand. Again, this suggests that the applicability of information need and uncertainty as motivational constructs is limited unless they are put in a specific context.

Since the viewpoint of the present study is unique, the findings cannot be directly compared to earlier investigations on information needs and uncertainty. However, the findings elaborate on the general picture of infomation need and uncertainty provided by review-type contributions by Anderson (2010), Case (2007: 68-83) and Naumer and Fisher (2010). The present study goes beyond the above investigations by shedding light upon the cognitive and affective aspects of information need and uncertainty. The most important contribution of the present study is the critical elaboration of the classic approaches to information need and uncertainty developed by Taylor (1968), Wilson (1981) and Kuhlthau (1993) in particular.

Implications for further development of the concepts of information need and uncertainty

As the analysis of the construct of information need indicated, the cognitive attribute alone cannot adequately capture the motivational phenomena; there is a need to consider affective factors as well. For this purpose, constructs such as *self-efficacy* (Bandura 1986) are potentially relevant for future studies of the motivators for information seeking. The expectation of efficacy is the estimation of whether a person can successfully execute the behavior. Therefore, self-efficacy is an important stimulator of information-seeking behaviour and it is constituted by both cognitive and affective attributes. Interestingly, Wilson (1997) opened the discussion about the potential of this category while developing the general model of information behaviour. However, further research is needed to examine the relevance of the concept of self-efficacy as a factor that triggers and drives information seeking. Such studies can be closely linked to the ideas of expectancy-value theory because the questions of self-efficacy deal with the information seeker's ability to perform an information-seeking task. Similarly, psychological theories of goal-setting (Ambrose and Kulik

1999: 246-253) are highly relevant from the perspective of the question, *Why am I doing this information-seeking task?*

Heinström (2010: 28) has recently drawn attention to the fact within library and information studies, the triggers of information seeking have predominantly been depicted as something negative: a gap or unpleasant lack of understanding. Instead of talking in terms of a shortage, such as gap, lack or need, one might instead point to what is an interest or a curiosity. Epistemic curiosity, a desire for new information, may be experienced as a positive anticipation and excitement, but also as a pressing and unsettling feeling of being at a loss. Similar to the construct of uncertainty, curiosity may entail both positive and negative dimensions (Anderson, 2006; Cole *et al.* 2005). Comparative studies may be made to examine how curiosity and interest are related to concepts of information need and uncertainty. Apparently, such investigations may contribute to the elaboration of the picture of the motivators for information seeking.

Conclusion

The findings of this study can be used to elaborate the picture of the factors that trigger and drive purposive information seeking in particular. First, the findings provide ideas for the refinement of the conceptual analysis of information need and uncertainty, as well as other motivators for information seeking, including anomalous state of knowledge (Belkin *et al.* 1982) and gap (Dervin 1983). The research results suggest that the analysis of cognitive and affective attributes of such motivators, as well as the study of their relationships would provide opportunities to dig deeper in conceptual studies. Second, the findings can be used to operationalise the concepts of information need and uncertainty in empirical studies. To this end, major questions such as, *Can I do this information-seeking task?, Why am I doing this information-seeking task?* and *How do I feel about the information-seeking task?*" can be further refined by taking into account the specific contexts in which information seeking takes place.

One of the limitations of the present study is that it confined to the examination of information need and uncertainty from the viewpoint of expectancy-value theory. There is a need to expand the research focus to encompass related concepts such as anomalous state of knowledge (Belkin *et al.* 1982; Cole *et al.* 2005) and gap (Dervin 1983). In addition, studies focusing on the motivators for interactive information retrieval or searching (Cole 2011; Xie 2007) may provide opportunities for the comparison of findings and the elaboration of the picture of the triggers and drivers of information behaviour more generally. To this end, the potential of cognitive psychological motivation theories, for example, attribution approaches (Weiner 2010), self-determination theory (Deci and Ryan 1985) and self-efficacy theory (Bandura 1986) should be examined in more detail. These efforts would serve the ends of renewing research approaches to motivators for information seeking and assessing the relevance of traditional concepts such as information need and uncertainty.

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